

Marshall University
MTH 416 / 616 : Advanced Differential Equations

Semester and Year	Spring 2017
Course Title	Advanced Differential Equations
Course Number	MTH 416 / 616
Section Number	201
CRN	4153 / 4168
Days and Time	Monday, Wednesday, Friday : 11:00 – 11:50am
Location	WAEK 3119
Credit Hours	3
Prerequisites	MTH 416 – MTH 300 and MTH 335

Professor	Dr. Anna Mummert
Office	Smith Hall 719
Phone	304 696 3041
E-mail	mummerta@marshall.edu
Office Hours	Monday and Wednesday 9:30 - 10:30am; Tuesday and Thursday 2:00 - 3:30pm; other hours by appointment

University Policies

By enrolling in this course, you agree to the University Policies listed below. Please read the full text of each policy by going to

<http://www.marshall.edu/academic-affairs/policies/>

Academic Dishonesty, Excused Absence Policy for Undergraduates, Computing Services Acceptable Use, Inclement Weather, Dead Week, Students with Disabilities, Academic Forgiveness, Academic Probation and Suspension, Academic Rights and Responsibilities of Students, Affirmative Action, and Sexual Harassment.

Course Description

MTH 416 / 616 - Advanced Differential Equations. Differential equations are studied qualitatively. Topics include the existence and uniqueness of solutions and the behavior of solutions including the stability of nonlinear systems, periodic solutions, and approximation using perturbation methods. 3 hours.

Course Learning Outcomes

Student Learning Outcomes for this course	How students will practice each outcome in this course	How student achievement of each outcome will be assessed in this course
Students will construct or recreate proofs of propositions and theorems related to differential equations.	In class activities, Homework	Exams, Portfolio
Students will apply the results of classical theorems of differential equations.	In class activities, Homework	Exams, Portfolio
Students will apply and extend qualitative properties of first order differential equations to higher order systems.	In class activities, Homework	Exams, Portfolio

Required Text

Kelley and Peterson. Springer 2010. *The Theory of Differential Equations – Classical and Qualitative*.

Homework

Homework will be assigned regularly.

You can work with other students on homework, though each person must enter their own solutions. Every class day will begin with time to discuss problems you are having with the homework questions.

Portfolio

This course will have a final project, instead of a final exam. You will submit a course portfolio at the end of the semester. A first draft will be due during the semester.

1. Draft due – Friday, March 17
2. Final portfolio due – Tuesday, May 2, 5:00pm

Exams

Two in-class exams will be given during the semester.

1. Friday, February 24
2. Friday, April 21

Late Assignments

Late assignments will only be accepted with an Excused Absence – university-sponsored activity, student illness, immediate family emergency, short-term military obligation, jury duty or court appearance, religious holiday. Students must provide evidence to justify a University Excused Absence on the first day you return to class.

Late assignment must be turned in within 1 week after you return to class.

Grading Policy

Any student caught cheating will receive a 0 on the assignment and Academic Affairs will be notified.

Homework: 25%

Exams: 50% total, 25% each

Portfolio: 25%

Percentage ranges for final grades are as follows:

A = 90-100% B = 80-89% C = 70-79% D = 60-69% F = 0-59%

Attendance Policy

Attendance is mandatory. Attendance will be taken every day. Students who arrive late will be considered absent and will not be given extra time on exams.

If you are absent with an Excused Absence, then please provide evidence to justify a University Excused Absence on the first day you return to class.

If you are absent for any reason, then it is your responsibility to make up any missed material.

Calculators and Other Technology

You may use a calculator on all work and assignments in this class. A graphing calculator (e.g. TI-84) is not required. You may not use your phone, iPad, laptop, etc. as a calculator on any quiz or exam.

No other technology may be used in class without permission.

Course Webpage

All important course information will be posted on our class MUOnline page.

Tentative Course Schedule

Date	Material / Topic Covered
Week 1	differential equations basic definitions (1.1) and linear first-order (1.2)
Week 2	autonomous equations (1.3), bifurcations (1.5)
Week 3	Picard iterates, linear systems (2.1), linear algebra review
Week 4	fundamental matrix, solutions to linear systems (2.2)
Week 5	matrix exponential (2.3), matrix norm and Lozinski measure (2.4)
Week 6	Floquet theory (2.5), autonomous systems (3.1)
Week 7	Exam 1
Week 8	phase plane diagrams (3.2 and 3.3)
Week 9	stability of non-linear systems (3.4)
Week 10	linearization of non-linear systems (3.5), periodic solutions (3.6), Portfolio Draft due
Week 11	perturbation methods (4.1), periodic solutions (4.2)
Week 12	self-adjoint second-order (5.1 and 5.2)
Week 13	variation of constants formula (5.3), Sturm-Liouville problem (5.4)
Week 14	Exam 2
Week 15	Green's functions (5.9)
Finals Week	Portfolio Due – Tuesday, May 2, 5:00pm

University Schedule

The complete university schedule can be found at

www.marshall.edu/calendar/academic/spring2017.asp